Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

centrum to intercentrum and *vice versa*, while the chevron bones being continua, cannot do so.

II. The neural arch actually does shift its position in Cricotus. In the posterior part of the caudal series it is principally on the intercentrum ; in the dorsal region it is on the centrum.

From the preceding considerations I get the following important results :

I. The principal vertebral bodies in the Sphenosauridæ[1] (Sphenosaurus and Chelydosaurus), if Fritsch's descriptions be correct, are intercentra and not centra.

II. It is probable that the true centra become extinct in the batrachian descendants of this family, so that the solid vertebræ of such Batrachia are intercentra, and not centra.

III. The characters of Cricotus on the other hand point to the extinction or reduction of the intercentra as we find it in the pelycosaurian Reptilia, and point to the probability of the Embolomeri being ancestors of the Reptilia, as I have already suggested.[2]

IV. The Sphenosauridæ (which must also include Sparagmites) are intermediate between the Rhachitomi and the Embolomeri, resembling rather the latter in the completion of the true centrum, but resembling the former in the incompleteness of the intercentrum.

I note here that Dr. Credner[3] does not understand why I should have overlooked the discovery of the rhachitomous structure of Archegosaurus by Von Meyer forty years ago. I think any one who examines Von Meyer's description and figures will find ample reason why one should not see the rhachitomous structure in them, without overstepping the bounds of scientific caution. And it is evident that European naturalists did not recognize this structure, as they make no mention of it during those forty years, although specimens of Archegosaurus are abundant; but rather frequently referred Archegosaurus to the Labyrinthodontia, which are described as having the vertebræ undivided.

I had hoped to have given before now engravings in quarto of these important forms, but the present U. S. Geological Survey having suspended my work, I am unable to do so.—*E. D. Cope.*

EMBRYOLOGY.[4]

The development of the Toad-fish.—The development of the Batrachidæ is not well known, as will appear from some of the statements in systemetic treatises. One author states that: "The young of some or all the species fasten themselves to rocks by means of an adhesive disk, which soon disappears."

It is the purpose of this notice to point out that the adhesive disk referred to above is of a wholly different nature and origin from that found in the lump-fishes and Gobiesocidæ in which such a disk is formed by the confluence or coalescence of the pectoral pair of fins.

---

[1] Cope. Naturalist, 1885, p. 592.

[2] American Naturalist., 1884, p. 37.

[3] Die Stegocephalen aus dem Plauenschen Grundes bei Dresden; Zeitschr. Deutsches Geol. Gessellsch., Berlin, 1885, p. 721.

[4] Edited by John A. Ryder, Smithsonian Institution, Washington, D. C.

The adult toad-fish burrows a cavity under one side of a submerged boulder, and to the solid roof of this cavity the female attaches her ova in a single layer. The eggs are very adhesive and quite large, measuring about one-fifth of an inch in diameter. Like the male cat-fish, the male toad-fish assumes charge of the adherent brood of eggs and remains by them until they are hatched and subsequently become free.

The egg-membrane or zona radiata is very firm, and adheres to the under surface of the stone by a discoidal area about 3^{mm} in diameter. The free globular pole of the egg is accordingly directed downwards. The germinal disk is developed at the lower pole and gradually spreads so as to enclose the vitellus from below upwards. The result is that the embryo is formed upon the lower or free pole of the egg, where it develops until it finally ruptures the egg membrane, when it may be said to have hatched, but, unlike all other types of fish-embryos known to me, the young fish does not at once drop out of the egg-membrane when the latter is ruptured. This is prevented by the adhesion of the ventral (now upper) pole of the yolk-sack to the inside of the egg-membrane just before the latter is ruptured. Just how this secondary adhesion of the yolk-sack is effected has not been determined, but the adhesion persists until the embryos are considerably over one-half inch in length.

In the course of the development of other parts, the yolk-sack is finally constricted horizontally round the middle below the body of the embryo, and becomes hour-glass-shape. This is due in part to the down growth of the mesoblastic somites on either side of the yolk from above; as a result of this a part of the yolk becomes intra-abdominal while a part of it remains for a time in the lower bulb of the yolk-sack and outside of the true abdominal cavity. Eventually the whole of the yolk becomes intra-abdominal; this is due in part to its further absorption and the further development of the abdominal walls of the embryo, but during all of this time, or until yolk-absorption is completed, the embryo remains adherent as described above. At this stage the embryo is so far developed that it would be recognizable as belonging to the genus Batrachus.

The pectoral and pelvic fins develop as very short folds which are close together, the latter arising almost immediately behind the former. In the course of further development, the pelvic fins are suddenly translocated forwards in advance of the pectorals, and are finally brought to lie near the constriction in the yolk-sack and just above the lower bulbous portion of the latter. It will therefore be obvious to any one that neither the pectoral nor pelvic fins have anything to do with causing the adhesion of the embryos, for both of these fins arise far above the point where the young fish is adherent.

The paired spinal nerves which pass to the pelvic fins are caused to cross those passing to the pectorals, because of the sudden translocation of the former pair of fins already alluded to.

It has also been stated by authors that Batrachus possesses no lateral line. This is an error, for the writer found that the neuromastic grooves or furrows, which remain open for a considerable time on the heads of the larvæ, are continued into a lateral line system on the sides, a condition of things which is also very evident in the adult, if the latter is carefully examined. There are also series of efferent pores present in the adults. The lateral neuromastic canal bifurcates in the vicinity of the shoulder-girdle and sends a dorsal branch backward below the base of the dorsal, and a ventral branch above the base of the anal. These two canals run nearly parallel along either side of the body and even extend backward upon the tail, as shown by some fine preparations of the skin of the embyro mounted by Professor Libbey, of Princeton.

Another point of some interest is the fact that the entire brood of young embryos upon any one stone have their heads directed one way and toward the light, which comes in at one side of the little retreat prepared by the adults. This is very remarkable and seems to indicate that the direction whence the light comes has some influence in determining the direction in which the embryonic axis will be formed in the blastoderm.

Very active movements of the tail, and especially of the pectoral fins, begin as soon as these parts are fairly developed; these movements become more energetic toward the close of the fixed stage of existence of the young toad-fish. It is very probable that the active wriggling movements of the young embryos finally frees them from the surface to which they are firmly glued by some adhesive material secreted by the yolk-sack, but which, like that which in the first place caused the egg-membrane to adhere, is not soluble in water.

The yolk is peculiarly homogeneous and does not readily coagulate or harden in the presence of ordinary reagents, such as chromic acid, as long as the egg-membrane is intact. There are no oil-drops present and the ova are much heavier than their own volume of sea-water. The number of ova found in one brood varies considerably, but it does not seem that there are ordinarily much over two hundred laid in one place. They are dirty-yellow in color and very firm to the touch, with a very narrow space between the vitellus and enveloping egg-membrane.

The development of the toad-fish is peculiar, if not unique, in presenting a prolonged fixed stage after the period of hatching or escape from the egg-membrane is over, during which all or nearly all of the yolk is absorbed. The embryo is therefore finally set free, without being encumbered by a heavy yolk, such as is met with in the embryos of the salmon. Such a provision obviously has its advantages, especially since the young are also guarded by the male parent during the period of their helpless fixation. One may frequently find recently hatched embryos, around the affixed pole of the yolk-sack of which shreds of the ruptured egg-membrane still adhere; during the later stages such shreds are not usually visible. There is a decidedly heterocercal tail developed from a special tail-fold, since there is no absolutely continuous median fin-fold developed, as in many other forms.

Oviposition occurs about the middle of July, in the latitude of Wood's Holl. How long it lasts has not been determined, but judging from the condition of the roes and milt of the adults at that time, it seems very probable that they do not spawn later.—*John A. Ryder.*

PHYSIOLOGY.[1]

CONDITIONS WHICH DETERMINE COAGULATION OF THE BLOOD.—Herr Holzmann adds something to our knowledge of the conditions of blood-clotting. His results are summed up as follows: 1. A body called fibrinogen, belonging to the class of globulins, can be obtained from horse's blood, and solutions of fibrinogen neither coagulate spontaneously at ordinary temperatures nor upon dilution with water. 2. Defibrinated blood, blood serum, watery extract of the albuminous coagulum formed in blood serum by the addition of alcohol, or the extract obtained from egg-albumin coagulated in the same way, the putrescent fluids obtained from cooked egg-albumin, and long-continued passage of oxygen, all cause typical coagulation of the solution of fibrinogen at ordinary temperatures, with the production of fibrin. 3. Fibrin-ferment is not peculiar to the blood, but occurs among the decomposition products of albumin. 4. It is probable that fibrin is the product of the oxidation of fibrinogen. 5. When a dog is rapidly bled to death (one and a half to three hours), the last portions of blood drawn clot quicker than the first, though the amount of fibrin formed does not markedly vary. 6. Venous blood clots more slowly than arterial blood; suffocation delays coagulation. Curare, chloralhydrate, chloroform, quinine and soda carbonate, also delay the coagulation.

SPECIAL PHYSIOLOGY OF THE EMBRYO.[2]— The last of the four separately issued parts of this work having now appeared, it becomes possible to speak of it as a whole. It may be said that the author has done for the physiology of the embryo what Balfour did for the morphology in his *Hand-book.* Some of the researches described here are closely connected with those on new-born children described in the author's previous work, *Die Seele des Kindes,* to which he has frequently occasion to make reference. His most important general results are that mobility appears long before sensibility, and that the sense-organs and the parts of the

---

[1] This department is edited by Professor HENRY SEWALL, of Ann Arbor, Michigan.

[2] By Professor W. Preyer, Leipzig, 1885. pp. XII. 644.